In the Claims

1. A system for pumping or mixing a fluid in a vessel, comprising:

a magnetic bearing for placement in the vessel;

at least one superconducting element for levitating said magnetic bearing;

a wall defining a chamber around the superconducting element, said chamber thermally isolating the superconducting element from the vessel;

a separate cooling source thermally linked to said superconducting element;

a motive device for rotating said magnetic bearing or said superconducting element.

2. The system for pumping or mixing a fluid according to claim 1, wherein the chamber is evacuated or insulated to minimize thermal transfer from said superconducting element to said wall and provide the desired thermal isolation.

3. The system for pumping or mixing a fluid according to claim 1, wherein said wall is the outer wall of a cryostat and said cooling source is a chamber in said cryostat holding a liquid cryogen.

4. The system for pumping or mixing a fluid according to claim 1, wherein said cooling source is a refrigerator.

5. The system for pumping or mixing a fluid according to claim 1, wherein said thermal linking is provided by a rod extending between said superconducting element and said cooling source.

6. The system for pumping or mixing a fluid according to claim 1, wherein said levitating magnetic bearing further includes a first permanent magnet positioned adjacent to said superconducting element but external to said wall.

7. The system for pumping or mixing a fluid according to claim 6, wherein said magnetic bearing further includes a second permanent magnet spaced from said first permanent magnet for forming a magnetic coupling with a drive magnet forming a part of said motive device, whereby said magnetic coupling serves to transmit driving torque from said drive magnet to said magnetic bearing.

8. The system for pumping or mixing a fluid according to claim 7, wherein said motive device for said magnetic bearing includes a motor for rotating said drive magnet.

9. The system for pumping or mixing a fluid according to claim

8, wherein said second permanent magnet includes at least two submagnets that correspond to opposite polarity submagnets forming a part of said drive magnet, whereby said cooperating submagnets serve to stabilize said magnetic bearing during rotation.

10. The system for pumping or mixing a fluid according to claim 1, wherein said wall is below said magnetic bearing and the vessel rests atop said wall.

11. The system for pumping or mixing a fluid according to claim 1, wherein a gap is provided between said superconducting element and an inner surface of said wall of approximately 0.01 to 5 millimeters.

12. The system for pumping or mixing a fluid according to claim 1, wherein the vessel includes an inlet and an outlet and said rotating magnetic bearing includes at least one blade for creating a pumping action that forces fluid to move from said inlet to said outlet.

13. The system for pumping or mixing a fluid according to claim 1, wherein said vessel is completely sealed and said magnetic bearing serves to mix the fluid only.

14. The system for pumping or mixing a fluid according to claim 1, wherein the vertical center axis of rotation of the magnetic bearing is offset

from the vertical center axis of the vessel.

15. The system according to claim 1, wherein the vessel is selected from the group consisting of an open-top container, a sealed container, a disposable container, a rigid container, a container having an inlet and an outlet, a hollow pipe and a flexible bag.

16. The system for pumping or mixing a fluid according to claim 1, wherein said superconducting element is supported by the wall defining said chamber, and wherein said chamber is in turn supported from a stable mounting structure by a bearing permitting rotational motion, said motive device rotating said wall and said superconducting element together.

17. The system for pumping or mixing a fluid according to claim 16, wherein the cooling source is a stationary container holding a cryogen, and the support for the superconducting element is provided by a thermal link rigidly connected to the wall and providing a dynamic thermal connection with the cooling source.

18. The system for pumping or mixing a fluid according to claim 16, wherein said motive device is a motor coupled to said wall by an endless belt, wherein said endless belt transfers the rotary motion produced by said motor to said wall to cause said superconducting element to rotate.

19. The system for pumping or mixing a fluid according to claim 16, wherein said cooling source is coupled to and rotates with said wall.

20. The system for pumping or mixing a fluid according to claim 16, wherein the vessel is a centrifugal pumping head having an inlet substantially at the center of a vessel wall opposite the side of the pumping head positioned adjacent to said superconducting element.

21. The system for pumping or mixing a fluid according to claim 16, wherein said chamber housing said superconducting element is positioned below said magnetic bearing in said vessel.

22. The system for pumping or mixing a fluid according to claim 16, wherein the vessel is supported by a stable support structure positioned between said superconducting element and said magnetic bearing.

23. The system for pumping or mixing a fluid according to claim 16, wherein the magnetic bearing includes first and second magnets having different polarities to create a non-symmetrical magnetic field with respect to an axis of rotation of said superconducting element.

24. The system for pumping or mixing a fluid according to claim 16, wherein the magnetic bearing includes at least one low-profile rod carrying first and second magnets, wherein said rod is capable of being

inserted in a relatively narrow opening in the vessel.

25. The system for pumping or mixing a fluid according to claim 16, wherein the magnetic bearing includes a pair of interconnected rods that are substantially orthogonal to each other in a nominal position with each rod carrying first and second magnets having the same polarities.

26. The system for pumping or mixing a fluid according to claim 25, wherein the rods are pinned together and are thus capable of rotating about a common center, wherein the rods can be rotated to a partially folded position for insertion through a narrow opening in a container.

27. The system for pumping or mixing a fluid according to claim 25, wherein at least one of the rods is formed of a flexible material and is thus capable of being deformed during insertion in the relatively narrow opening in the vessel.

28. The system for pumping or mixing a fluid according to claim 1, wherein said motive device is positioned adjacent to and on the same side of the vessel as the superconducting element.

29. The system for pumping or mixing a fluid according to claim 28, wherein said superconducting element is annular and at least a portion of said motive device for rotating said levitating magnetic bearing is concentric

with and adjacent to the annular superconducting element.

30. The system for pumping or mixing a fluid according to claim 29, wherein a portion of the chamber defined by said wall is annular for receiving said annular superconducting element.

31. The system for pumping or mixing a fluid according to claim 30, wherein said motive device includes a shaft carrying at least first and second driving magnets at one end, said driving magnets being inserted in a thermally separated or isolated bore formed by said wall concentric with the annular chamber for housing said superconducting element.

32. The system for pumping or mixing a fluid according to claim 28, further including a platform in said chamber for supporting the superconducting element, wherein the platform is thermally linked to the separate cooling source.

33. The system for pumping or mixing a fluid according to claim 32, wherein the thermal linking is provided by a rod extending from the cooling source to the platform for supporting the superconducting element.

34. The system for pumping or mixing a fluid according to claim 32, wherein the chamber housing the superconducting element is evacuated and also houses a thermal link between the cooling source and the platform.

35. The system for pumping or mixing a fluid according to claim 28, wherein said motive device includes a shaft carrying at least first and second driving magnets.

36. The system for pumping or mixing a fluid according to claim 35, wherein said magnetic bearing comprises:

a levitation magnet substantially corresponding in size and shape to the superconducting element;

at least two driven magnets having opposite polarities, said driven magnets being aligned with said first and second driving magnets rotated by said motive device,

whereby said levitation magnet levitates said bearing while said driven magnets transmit rotary motion from said driving magnets to said magnetic bearing.

37. The system for pumping or mixing a fluid according to claim 28, wherein the cooling source is a container of a liquid cryogen or a closed-cycle refrigerator.

38. The system for pumping or mixing a fluid according to claim 37, wherein the cooling source is the liquid cryogen container and the chamber housing the superconducting element is evacuated and also houses the cooling source.

39. The system for pumping or mixing a fluid according to claim 1, further including a transmitter for transmitting a signal or receiver for receiving the signal, and wherein either said magnetic bearing or the vessel includes one of the transmitter or the receiver and the other is positioned adjacent to said superconducting element, wherein the operation of said motive device is restricted until the signal generated by the transmitter is received by said receiver.

40. The system for pumping or mixing a fluid according to claim 28, wherein the vessel is a centrifugal pumping head having an inlet substantially at the center of a vessel wall opposite the side of the pumping head positioned adjacent to said superconducting element.

41. The system for pumping or mixing a fluid according to claim 28, wherein the vessel is a pipe, the wall defining the chamber for thermally isolating the superconducting element is positioned inside of the pipe and includes a thermally separated or isolated bore for receiving a driven shaft carrying a plurality of alternating polarity driving magnets forming a part of said motive device, said driving magnets magnetically coupling with a plurality of corresponding driven magnets in or on said magnetic bearing.

42. The system for pumping or mixing a fluid according to claim 1, wherein the vessel is a pipe, the superconducting element includes at least two superconducting members each thermally separated or isolated from the

outer surface of the pipe, and said bearing includes at least two levitation magnets, each corresponding to one of said at least two superconducting members, whereby said magnetic bearing is levitated in said pipe as a result of the interaction between each said superconducting members and the corresponding levitation magnet.

43. The system for pumping or mixing a fluid according to claim 42, wherein said magnetic bearing further includes a plurality of alternating polarity driven magnets.

44. The system for pumping or mixing a fluid according to claim 43, wherein the motive device includes a bearing positioned outside of said pipe for rotatably supporting a driving magnet assembly carrying a plurality of alternating polarity driving magnets, a motor, and an endless belt for transmitting rotary motion from said motor to said driving magnet assembly, wherein the driving magnet assembly upon rotating creates a varying magnetic field that influences said driven magnets and causes said magnetic bearing to rotate.

45. The system for pumping or mixing a fluid according to claim 43, wherein the motive device includes a winding positioned external to said pipe and a power supply for supplying an electrical current to said winding, wherein said winding creates an electrical field that causes said levitating magnetic bearing to rotate in said pipe.

46. The system for pumping or mixing a fluid according to claim 1, wherein said bearing includes at least one levitation-assist chamber for holding a substance that is lighter than the fluid in said vessel, whereby the chamber assists in levitating the magnetic bearing in the fluid.

47. The system for pumping or mixing a fluid according to claim 1, wherein the motive device is a first motive device, and further including a second motive device for moving the superconducting element relative to the vessel, whereby effective, non-localized pumping or mixing action may be provided by the magnetic bearing as a result.

48. The system for pumping or mixing a fluid according to claim 47, wherein the second motive device is a linear motion device.

49. The system for pumping or mixing a fluid according to claim 47, wherein:

said superconducting element is supported by the wall defining said chamber, and wherein said chamber is in turn supported from a stable mounting structure by a bearing permitting rotational motion, said motive device rotating said wall and said superconducting element together;

said first motive device is a motor coupled to said wall by an endless belt, wherein said endless belt transfers the rotary motion produced by said motor to said wall to cause said superconducting element to rotate;

and

wherein the second motive device includes a support structure for supporting the wall, the stable mounting structure, and the motor and a linear motion device for moving the support structure to and fro relative to the vessel.

50. A system for mixing a fluid, comprising:

a vessel for holding the fluid;

a magnetic bearing for positioning in said vessel;

a superconducting element;

a housing defining a chamber around said superconducting element for thermally isolating said superconducting element from said vessel;

a cooling source thermally linked to said superconducting element; and

a motive device for rotating said magnetic bearing or said superconducting element.

51. The mixing system according to claim 50, wherein said chamber surrounding said superconducting element is evacuated to minimize thermal transfer to said housing and provide the desired thermal isolation.

52. The mixing system according to claim 50, wherein said vessel includes an inlet and an outlet and said magnetic bearing further includes at

least one blade or vane for creating a pumping action that forces fluid to move from said inlet to said outlet.

53. The mixing system according to claim 50, wherein said vessel is completely sealed from the outside environment.

54. The mixing system according to claim 50, wherein said vessel and magnetic bearing are disposable.

55. A system for pumping or mixing a fluid in a vessel positioned on a stable support structure, comprising:

a magnetic bearing for placement in the vessel;

at least one superconducting element for levitating said magnetic bearing;

a cooling source thermally linked to said superconducting element in said chamber;

a motive device for rotating said superconducting element.

56. The system for pumping or mixing a fluid according to claim 55, further including a wall defining a chamber for thermally isolating the superconducting element, and wherein said wall and chamber are rotated along with the superconducting element.

57. The system for pumping or mixing a fluid according to claim

56, wherein a thermal link to said cooling source extends at least partially through said chamber and directly supports the superconducting element, said wall defining said chamber is supported by a bearing permitting rotational motion, said motive device is a motor coupled to said chamber by an endless belt, and said endless belt transfers the rotary motion produced by said motor to said wall and said thermal link to rotate the superconducting element.

58. The system for pumping or mixing a fluid according to claim 56, wherein said cooling source contains a liquid cryogen and is attached to and rotates with said wall and chamber.

59. The system for pumping or mixing a fluid according to claim 56, wherein said chamber housing said superconducting element is positioned below said magnetic bearing in said vessel.

60. The system for pumping or mixing a fluid according to claim 55, wherein said magnetic bearing includes at least one blade or vane, whereby said blade or vane provides the desired pumping or mixing action when the bearing is rotated.

61. The system for pumping or mixing a fluid according to claim 55, wherein said vessel is a centrifugal pumping head having an inlet and an outlet, wherein the rotation of said magnetic bearing causes the fluid to move

from the inlet to the outlet.

62. The system for pumping or mixing a fluid according to claim 61, wherein the inlet is in a vessel wall of the pumping head opposite a side of the pumping head adjacent to the superconducting element.

63. The system for pumping or mixing a fluid according to claim 55, wherein the vessel is supported by a stable support structure positioned between said superconducting element and said magnetic bearing.

64. The system for pumping or mixing a fluid according to claim 55, wherein the magnetic bearing includes first and second magnets having different polarities to create a non-symmetrical magnetic field with respect to an axis of rotation of said superconducting element.

65. The system for pumping or mixing a fluid according to claim 55, wherein the vessel is selected from the group consisting of an open-top container, a sealed container, a container having an inlet and an outlet, a disposable container, a rigid container, a pipe, and a flexible bag.

66. The system for pumping or mixing a fluid according to claim 55, wherein the magnetic bearing includes at least one low-profile rod carrying first and second magnets having the different polarities, said rod being capable of insertion in a relatively narrow opening in the vessel.

67. The system for pumping or mixing a fluid according to claim 55, wherein the magnetic bearing includes a pair of interconnected rods that are substantially orthogonal to each other in a nominal position, each carrying first and second magnets having the same polarity.

68. The system for pumping or mixing a fluid according to claim 67, wherein the rods are pinned together and are thus capable of rotating about a common center, wherein the rods can be rotated to a partially folded position for insertion through a narrow opening in a container.

69. The system for pumping or mixing a fluid according to claim 67, wherein at least one of the rods is formed of a flexible material and is thus capable of deforming for insertion in the relatively narrow opening in the vessel.

70. A system for pumping or mixing a fluid in a vessel, comprising:

a magnetic bearing for placement in the vessel;

a superconducting element for levitating said magnetic bearing;

a wall defining a chamber around the superconducting element, said chamber thermally isolating the superconducting element from the vessel;

a separate cooling source thermally linked to said superconducting element;

a motive device for rotating said magnetic bearing, wherein at

least a portion of said motive device is positioned adjacent to and concentric with the superconducting element.

71. The system for pumping or mixing a fluid according to claim 70, wherein said superconducting element is annular and at least a portion of said motive device is position in a center opening of the annular superconducting element.

72. The system for pumping or mixing a fluid according to claim 71, wherein a portion of the chamber defined by said wall is annular for receiving said annular superconducting element.

73. The system for pumping or mixing a fluid according to claim 72, further including a platform in said chamber for supporting the superconducting element, wherein the platform is thermally linked to the separate cooling source.

74. The system for pumping or mixing a fluid according to claim 73, wherein the chamber housing the superconducting element is evacuated and also houses a thermal link from the cooling source to the platform supporting the superconducting element.

75. The system for pumping or mixing a fluid according to claim 70, wherein the cooling source is a container of a liquid cryogen or a closed-cycle

refrigerator.

76. The system for pumping or mixing a fluid according to claim 75, wherein the cooling source is a liquid cryogen container and the chamber housing the superconducting element is evacuated and also houses the cooling source.

77. The system for pumping or mixing a fluid according to claim 70, wherein said motive device includes a shaft carrying a plurality of alternating polarity driving magnets corresponding to a plurality of driven magnets on said magnetic bearing, said driving magnets being received in a thermally separated or isolated bore formed by the wall defining the chamber around said superconducting element.

78. The system for pumping or mixing a fluid according to claim 77, wherein said magnetic bearing comprises:

a levitation magnet corresponding in size and shape to the superconducting element;

at least two driven magnets having opposite polarities, said driven magnets being aligned with the corresponding driving magnets of said motive device,

whereby said levitation magnet levitates said bearing while said driven magnets transmit rotary motion to said bearing from said driving magnets.

79. The system for pumping or mixing a fluid according to claim 78, wherein said levitation magnet is annular.

80. The system for pumping or mixing a fluid according to claim 70, wherein said magnetic bearing carries at least one blade or vane.

81. The system for pumping or mixing a fluid according to claim 70, wherein said chamber is evacuated or filled with an insulating material.

82. The system for pumping or mixing a fluid according to claim 70, wherein the vessel is a pipe, the wall defining the chamber thermally isolating the superconducting element is positioned inside of said pipe and includes a thermally separated or isolated bore for receiving a driven shaft carrying a plurality of alternating polarity driving magnets forming a part of said motive device and magnetically coupling with a plurality of corresponding driven magnets in or on said magnetic bearing.

83. A system for pumping or mixing a fluid in a vessel, comprising:

a magnetic bearing for placement in the vessel;

at least one superconducting element for levitating said magnetic bearing;

a wall defining a chamber around the superconducting element, said chamber thermally isolating the superconducting element from the vessel;

a separate cooling source thermally linked to said superconducting element;

a first motive device for rotating said magnetic bearing or said superconducting element;

a second motive device for moving the superconducting element relative to the vessel,

whereby moving the superconducting element ensures that effective, non-localized pumping or mixing action is afforded by the levitating, rotating bearing.

84. The system for pumping or mixing a fluid according to claim 83, wherein the second motive device is a linear motion device for moving the superconducting element to and fro.

85. The system for pumping or mixing a fluid according to claim 83, wherein:

said superconducting element is supported by the wall defining said chamber, and wherein said chamber is in turn supported from a stable mounting structure by a bearing permitting rotational motion, said motive device rotating said wall and said superconducting element together;

said first motive device is a motor coupled to said wall by an endless belt, wherein said endless belt transfers the rotary motion produced by said motor to said wall to cause said superconducting element to rotate; and

wherein the second motive device includes a support structure

for supporting the wall, the stable mounting structure, and the motor, and a linear motion device for moving the support structure to and fro relative to the vessel.

86. An assembly for use in containing a fluid undergoing a pumping or mixing operation, comprising:

a vessel formed of a flexible disposable material capable of holding the fluid; and

a levitating magnetic bearing positioned in said vessel,

whereby said magnetic bearing is levitated in the vessel and can be disposed of along with said vessel when said pumping or mixing operation is complete.

87. The assembly according to claim 86, wherein the vessel is selected from the group consisting of an open-top container, a pipe, a container having an inlet and an outlet, a sealed container, and a bag.

88. The assembly according to claim 86, further including a rigid or semi-rigid support container for receiving and providing support for said flexible vessel.

89. The assembly according to claim 86, further including an attachment for placement over the flexible container carrying a coupler for coupling with the magnetic bearing prior to use.

90. A system for pumping or mixing a fluid, comprising:

a vessel capable of holding the fluid;

a levitating magnetic bearing positioned in the vessel, said bearing capable of being rotated in a non-contact fashion to create the pumping or mixing action;

a controller for controlling the rotation of said magnetic bearing;

a transmitter for generating a signal; and

a receiver for receiving the signal generated by the transmitter;

wherein one of said vessel or said bearing carries the transmitter for generating the signal or the receiver for receiving the signal generated by the transmitter, and wherein said controller prevents said bearing from rotating until an appropriate signal is received by the receiver.

91. A kit for assisting in the set-up of a fluid pumping or mixing system wherein a magnetic bearing including at least one levitation magnet is levitated in a vessel by a superconducting element in communication with a cooling source for cooling the superconducting element to a transition temperature during a field cooling process, comprising:

at least one charging magnet substantially corresponding in size, shape, and magnetic field distribution to the at least one levitation magnet of the magnetic bearing, wherein the charging magnet is placed over the superconducting element during cooling to create a magnetic field, whereby the presence of the magnetic field during cooling serves to charge the superconducting element for levitating the magnetic bearing in the vessel.

92. The kit according to claim 91, further including a plurality of charging magnets, each corresponding in size, shape, and magnetic field distribution to the at least one levitation magnet in one of a plurality of magnetic bearings for use in the pumping or mixing system.

93. The kit according to claim 91, further including a spacer for spacing the charging magnet from the superconducting element at a predetermined level, wherein this spacing serves to define a levitation height of the magnetic bearing above the superconducting element during field cooling.

94. A system for pumping or mixing a fluid in a vessel, comprising:

a magnetic bearing for placement in the vessel;

at least one superconducting element for levitating said magnetic bearing;

a separate cooling source thermally linked to said superconducting element;

a motive device for rotating one of said magnetic bearing or said superconducting element,

wherein said bearing includes at least one levitation-assist chamber for holding a substance that is lighter than the fluid in said vessel, whereby the chamber assists in levitating the magnetic bearing in the fluid.

95. The system for pumping or mixing a fluid according to claim 94, wherein said substance is air.

96. The system for pumping or mixing a fluid according to claim 94, wherein said levitating magnetic bearing further includes a first permanent magnet positioned adjacent to said superconducting element and a second permanent magnet spaced from said first permanent magnet for forming a magnetic coupling with a drive magnet forming a part of said motive device, wherein a levitation-assist chamber is provided on each of said magnetic bearings.

97. The system for pumping or mixing a fluid according to claim 96, wherein a shaft is provided for coupling said first and second permanent magnets together, wherein a levitation-assist chamber is provided around at least a portion of said shaft.

98. A cryostat for keeping an annular superconducting element thermally isolated from the ambient environment, comprising:

an outer wall defining an annular chamber for housing the annular superconducting element, said annular chamber being evacuated or insulated to thermally isolate the superconducting element from the wall.

99. The cryostat according to claim 98, wherein the wall defining said annular chamber also defines a thermally separated and isolated bore,

whereby said bore has an upper wall for supporting a fluid containing vessel adjacent to said cryostat and an open end for receiving at least a portion of a motive device for rotating a magnetic bearing carried in the vessel.

100. The cryostat according to claim 98, further including a second evacuated or insulated chamber for housing a thermal link to the superconducting element from a cooling source.

101. The cryostat according to claim 99, further including a third chamber for housing the cooling source.

102. The cryostat according to claim 99, wherein the first, second, and third chambers are in fluid communication and may be evacuated by a single vacuum source.

103. A magnetic bearing for use in a pumping or mixing system having an annular superconducting element and a concentric motive device including a plurality of driving magnets, comprising:

an annular levitation magnet for positioning adjacent to and in substantial alignment with the annular superconducting element;

a plurality of permanent driven magnets positioned in the opening in said annular levitation magnet, whereby said driven magnets align and magnetically couple with the driving magnets of said motive device.

104. A magnetic bearing for levitating and rotating adjacent to a superconducting element to pump or mix a fluid held in a vessel having a relatively narrow opening, comprising:

at least one elongated rod carrying first and second levitation magnets, said rod having a length that exceeds a major dimension of the opening in the vessel,

wherein said rod is capable of being inserted in the relatively narrow opening in the vessel and moving to a position where the magnets are in substantial alignment with the superconducting element.

105. The bearing according to claim 104, wherein the rod is formed of a flexible material and is thus capable of being deformed during insertion in the relatively narrow opening in the vessel.

106. A magnetic bearing for levitating and rotating above a superconducting element to pump or mix a fluid held in a vessel having a relatively narrow opening, comprising:

a pair of interconnected, elongated rods positioned substantially orthogonal to each other in a nominal position, each carrying first and second levitation magnets having the same polarity, each said rod having a length that exceeds a major dimension of said opening;

wherein at least one of said rods is capable of being folded for passing through the relatively narrow opening in the vessel and moving to a position where the levitation magnets are in substantial alignment with the

superconducting element.

107. The bearing according to claim 106, wherein the rods are pinned together and are thus capable of rotating about a common center, wherein the rods can be rotated to a partially folded position about the pinned connection for passing through a narrow opening in a container.

108. The bearing according to claim 106, wherein the rods are rigidly coupled together and at least one of the rods is formed of a flexible material, whereby the flexible rod is capable of being deformed for passing through relatively narrow opening in the vessel.

109. A system for levitating a magnet, comprising:

at least one superconducting element;

a cooling source thermally linked to the superconducting element, said cooling source cooling the superconducting element to a transition temperature in the presence of a magnetic field to induce levitation in the magnet;

a heater for warming said superconducting element to above the transition temperature such that the superconducting element may again be cooled in the presence of the same or a different magnetic field to induce levitation in the same or a different magnet.

110. The system according to claim 109, wherein the heater is an

electric coil positioned adjacent to the superconducting element and in communication with a power supply.

111. A method of levitating and rotating a magnetic bearing for pumping or mixing a fluid, comprising:

placing the magnetic bearing in the vessel;

levitating the magnetic bearing above a superconducting element positioned in an evacuated or insulated chamber adjacent to the vessel and thermally linked to a separate cooling source; and

rotating the magnetic bearing in the vessel.

112. The method according to claim 111, further including the steps of placing said magnetic bearing in the vessel prior to filling the vessel with a fluid, and after mixing or pumping is completed, disposing of said magnetic bearing and vessel.

113. The method according to claim 112, including the step of completely sealing the vessel prior to rotating said magnetic bearing.

114. The method according to claim 111, wherein the magnetic bearing includes at least two magnets having different polarities to create a non-symmetrical magnetic field relative to an axis of rotation, and said step of rotating the magnetic bearing includes rotating the superconducting element to cause said magnetic bearing to rotate about said axis.

115. The method according to claim 111, wherein the vessel is a flexible bag for containing the fluid, and the method further includes placing the bearing in the flexible bag prior to filling the bag with the fluid.

116. A method of levitating and rotating a magnetic bearing for pumping or mixing a fluid, comprising:

placing a magnetic bearing carrying first and second magnets having different polarities to create a non-symmetrical magnetic field in a vessel;

levitating the magnetic bearing in the vessel using a superconducting element;

rotating the superconducting element to induce rotation in the bearing.

117. A method of levitating and rotating a magnetic bearing for pumping or mixing a fluid, comprising:

placing a magnetic bearing in the vessel;

levitating the magnetic bearing in the vessel using a superconducting element;

rotating the magnetic bearing using a driving magnet positioned adjacent to and concentric with the superconducting element.

118. A method of charging a superconducting element for levitating

a magnetic bearing in a vessel, comprising the steps of:

placing a charging magnet corresponding to the magnetic bearing in size, shape, and magnetic field distribution adjacent to the superconducting element;

cooling the superconducting element to below a transition temperature;

removing the charging magnet;

positioning the magnetic bearing in the vessel over the superconducting element.

119. The method according to claim 118, further including spacing the charging magnet a preselected distance from the superconducting element during cooling, whereby the preselected distance corresponds to the levitation height of the magnetic bearing.

120. The method according to claim 118, further including removing the magnetic bearing, warming the superconducting element to above the transition temperature, positioning a different charging magnet over the superconducting element, cooling the superconducting element to below the transition temperature, and positioning a different magnetic bearing corresponding in size, shape, and magnetic field distribution to the different charging magnet over the superconducting element.

121. A method of levitating and rotating a magnetic bearing in a fluid

containing vessel, comprising:

placing a magnetic bearing having at least one chamber containing a substance that is lighter than the fluid held in the vessel;

levitating the magnetic bearing above a superconducting element positioned in an evacuated or insulated chamber adjacent to the vessel and thermally linked to a separate cooling source; and

rotating the magnetic bearing in the vessel,

whereby the substance in the chamber assists in levitating the magnetic bearing in the fluid.

122. A method of ensuring that a levitating magnetic bearing for pumping or mixing a fluid corresponds to an adjacent pumping or mixing system, comprising:

providing a transmitter on or adjacent to one of the magnetic bearing or the pumping or mixing system for transmitting a signal;

providing a receiver on or adjacent to the opposite of the magnetic bearing or the pumping or mixing system for receiving the signal generated by the transmitter;

preventing the operation of the system until the signal is received by the receiver.

123. A method of levitating and rotating a magnetic bearing for pumping or mixing a fluid in a vessel, comprising:

placing the magnetic bearing in the vessel;

levitating the magnetic bearing above a superconducting element positioned in an evacuated or insulated chamber adjacent to the vessel and thermally linked to a separate cooling source;

rotating the magnetic bearing in the vessel;

moving the superconducting element relative to the vessel,

whereby the rotating magnetic bearing follows the movement of the superconducting element to ensure that effective, non-localized pumping or mixing action is provided.

124. The method according to claim 123, wherein the step of rotating the magnetic bearing includes rotating the superconducting element, and wherein the step of moving the superconducting element includes moving the superconducting element to and fro relative to the vessel in a linear fashion.